Complete Summary

GUIDELINE TITLE

ACR Appropriateness Criteria™ for routine admission and preoperative chest radiography.

BIBLIOGRAPHIC SOURCE(S)

American College of Radiology (ACR), Expert Panel on Thoracic Imaging. Routine admission and preoperative chest radiography. Reston (VA): American College of Radiology (ACR); 2000. 5 p. (ACR appropriateness criteria). [36 references]

GUIDELINE STATUS

This is the current release of the guideline.

All Appropriateness Criteria™ are reviewed annually and updated as appropriate.

COMPLETE SUMMARY CONTENT

SCOPE
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SCOPE

DISEASE/CONDITION(S)

Indications of cardiopulmonary disease

GUIDELINE CATEGORY

Diagnosis
Evaluation

CLINICAL SPECIALTY

Cardiology
Family Practice

Internal Medicine
Radiology
Surgery

INTENDED USERS

Physicians

GUIDELINE OBJECTIVE(S)

To provide appropriate recommendations for routine admission and preoperative chest radiography

TARGET POPULATION

Admitted and preoperative patients with known or suspected acute or chronic cardiopulmonary disease

INTERVENTIONS AND PRACTICES CONSIDERED

Chest radiography

1. Routine admission chest x-ray
2. Preoperative chest x-ray

MAJOR OUTCOMES CONSIDERED

Diagnostic utility (i.e., sensitivity, specificity) of chest radiologic exam procedures

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

The guideline developer performed literature searches of recent peer-reviewed medical journals, primarily using the National Library of Medicine's MEDLINE database. The developer identified and collected the major applicable articles.

NUMBER OF SOURCE DOCUMENTS

The total number of source documents identified as the result of the literature search is not known.

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Weighting According to a Rating Scheme (Scheme Not Given)

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Not stated

METHODS USED TO ANALYZE THE EVIDENCE

Review of Published Meta-Analyses
Systematic Review with Evidence Tables

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

One or two topic leaders within a panel assume the responsibility of developing an evidence table for each clinical condition, based on analysis of the current literature. These tables serve as a basis for developing a narrative specific to each clinical condition.

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus (Delphi)

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

Since data available from existing scientific studies are usually insufficient for meta-analysis, broad-based consensus techniques are needed to reach agreement in the formulation of the Appropriateness Criteria. Serial surveys are conducted by distributing questionnaires to consolidate expert opinions within each panel. These questionnaires are distributed to the participants along with the evidence table and narrative as developed by the topic leader(s). Questionnaires are completed by the participants in their own professional setting without influence of the other members. Voting is conducted using a scoring system from 1-9, indicating the most to the least appropriate imaging examination or therapeutic procedure. The survey results are collected, tabulated in anonymous fashion, and redistributed after each round. A maximum of three rounds is conducted and opinions are unified to the highest degree possible. Eighty (80) percent agreement is considered a consensus. If consensus cannot be reached by this method, the panel is convened and group consensus techniques are utilized. The strengths and weaknesses of each test or procedure are discussed and consensus reached whenever possible.

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Not applicable

COST ANALYSIS

The guideline developers reviewed published cost analyses.

- The available evidence does not support a policy for performing routine admission or preoperative chest radiographs for all patients. Although there is no evidence available showing that such a policy would lead to worse outcomes for patients, the finding that only 2% of chest radiographs lead to a change in management of patients suggests a high level of cost and inconvenience with potentially limited benefits.
- It has been shown that there is insufficient diagnostic yield to warrant the use of non-indicated chest radiography as part of a routine physical examination. Especially in a healthy population, screening chest radiographs have a high cost-benefit ratio. Scheduling a patient for surgery does not improve the benefit. An operation, per se, does not constitute a risk factor requiring chest radiographs.

METHOD OF GUIDELINE VALIDATION

Internal Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

Criteria developed by the Expert Panels are reviewed by the American College of Radiology (ACR) Task Force on Appropriateness Criteria and the Chair of the ACR Board of Chancellors.

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

ACR Appropriateness Criteria™

Clinical Condition: Routine Admission and Preoperative Chest Radiography

Variant 1: Asymptomatic; history and physical unremarkable

Radiologic Exam Procedure	Appropriateness Rating	Comments
Routine admission chest x-ray	2	
Preoperative chest x-ray	2	
Appropriateness Criteria Scale 1 2 3 4 5 6 7 8 9 1=Least appropriate 9=Most appropriate		

Variant 2: Acute cardiopulmonary findings by history or physical

Radiologic Exam Procedure	Appropriateness Rating	Comments
Routine admission chest x-ray	9	
Preoperative chest x-ray	9	

Radiologic Exam Procedure	Appropriateness Rating	Comments
Appropriateness Criteria Scale 1 2 3 4 5 6 7 8 9 1=Least appropriate 9=Most appropriate		

Variant 3: Chronic cardiopulmonary disease in the elderly (>65-year-old), previous CXR within 6 months available

Radiologic Exam Procedure	Appropriateness Rating	Comments
Preoperative chest x-ray	6	
Routine admission chest x-ray	4	
Appropriateness Criteria Scale 1 2 3 4 5 6 7 8 9 1=Least appropriate 9=Most appropriate		

Variant 4: Chronic cardiopulmonary disease in the elderly (>65-year-old), previous CXR within 6 months not available

Radiologic Exam Procedure	Appropriateness Rating	Comments
Routine admission chest x-ray	8	
Preoperative chest x-ray	8	
Appropriateness Criteria Scale 1 2 3 4 5 6 7 8 9 1=Least appropriate 9=Most appropriate		

Routine chest radiography obtained at the time of admission to hospital and in the preoperative setting has been a common practice. This guideline will address the utilization and efficacy of such routine chest radiography in both settings. Most routine chest radiography is done in the preoperative setting rather than as part of a routine admission for medical reasons. However, there are several studies in the literature addressing the use of routine chest radiography prior to nonsurgical procedures, at the time of admission for various medical conditions, and for all elderly patients admitted to the hospital. Several studies have addressed the use of routine chest radiography prior to interventional but nonsurgical procedures. A study by Malone et al regarding the routine utilization of chest radiography prior to biliary lithotripsy reviewed a group of 75 patients referred for this procedure. All patients underwent posteroanterior (PA) and lateral chest radiographs. No significant pulmonary or pleural disease was noted in any of the patients. A similar study by Grier et al documented that routine chest radiography prior to angiography was not necessary in the absence of any specific clinical indications.

In their series of 240 patients, no angiogram was postponed or canceled because of abnormalities detected on the routine chest radiograph.

Routine Admission Chest Radiography

Several studies have addressed the utility of routine chest radiographs in patients admitted for various clinical conditions including acute gastrointestinal hemorrhage, acute stroke and in the elderly. None of these studies supported the use of routine radiography in these patient groups unless there were clinical indications of cardiac or pulmonary disease. Gupta et al prospectively studied 1,000 consecutive admissions to an acute geriatric ward and demonstrated that 35%- 50% of these patients had little or no clinical indication for routine chest radiograph examination and that omitting this study in these patients would not have resulted in any significant chest conditions. The remainder of the population had signs and symptoms, or other evidence of pulmonary or cardiovascular disease, or other clinical features that indicated the need for chest radiography. Of the 35% with no indication for chest radiography, 5.5% did have some abnormality, but in only 3 (less than 1%) was this considered to be significant. Of the 65% who had some indication for a chest radiograph, 17% of the total had known chronic cardiac or pulmonary disease and in these, radiologic findings did not contribute to further management. Hubbell et al studied the impact of routine admission chest radiography on the treatment of patients on internal medicine wards at a Veteran´s Administration hospital in California. In a population of 294 patients, 36% had abnormalities noted on the routine admission chest radiograph. However, the findings were previously known to be chronic and stable in 86 patients and were new in only 20. Treatment was changed because of the chest radiographic results in only 4% of the patients, and in only one of these patients would appropriate treatment probably have been omitted had the chest radiograph not been obtained. The recommendation from this study was that routine chest radiographs should not be ordered solely because of admission. It is of particular interest to note that this patient population had a very high prevalence of both chronic cardiac and pulmonary disease.

Preoperative Chest Radiography

In the United States, more than $30 billion is spent on preoperative testing annually. Chest radiography is included in many centers for routine preoperative evaluation. As is evident, the study is a relatively low-cost, low-risk procedure to screen or evaluate for occult or known cardiopulmonary disease. However, in the past two decades, the efficacy of its use, along with other routine preoperative laboratory studies, has been the issue of multiple studies.

In 1979, the Royal College of Radiologists published a multicenter study that retrospectively examined 10,619 preoperative chest radiographs in patients undergoing elective noncardiopulmonary surgery. The conclusion was that the preoperative chest radiograph did not influence the decision to operate or the choice of anesthetic. Rucker evaluated the usefulness of preoperative chest radiographs in 905 patients based upon risk factors including history of malignancy, recent history of smoking, exposure to toxic chemicals or by signs and symptoms of recent infection. He concluded that a group of patients does exist for whom preoperative chest radiographs will predictably demonstrate no serious abnormalities and that this low-risk population constitutes the majority of

the surgical population. Charpak et al evaluated the utility of preoperative chest radiographs in 3,883 patients. They found that routine preoperative chest radiographs could be eliminated without undesirable effects on patient care or outcome. In a study of 1,000 patients by Gagner, the recommendation was that preoperative chest radiographs should only be ordered when there is a cardiopulmonary abnormality suspected on the basis of the history and physical examination. He emphasized that preoperative chest films should not be routine in any age group. Archer et al performed a meta-analysis on 21 studies written between 1966 and 1992. They reported that abnormalities were found in approximately 10% of routine preoperative chest radiographs. Only 1.3% of the abnormalities were unexpected on the basis of the history and physical examination. The test results were of sufficient importance to cause modification of management in only 0.1%. In 1997, Munro et al published a review of 46 empirical studies that included preoperative chest radiographs. They concluded that the available evidence does not support the practice of routine chest radiographs for all patients.

Despite the lack of support in the literature, there remains wide variation in the utilization of preoperative chest radiographs. Some proponents believe that the study is an extension of a general physical examination and, as such, should be routinely included in a preoperative evaluation. However, it has been shown that there is insufficient diagnostic yield to warrant the use of nonindicated chest radiography as part of a routine physical examination. Especially in a healthy population, screening chest radiographs have a high cost-benefit ratio. Scheduling a patient for surgery does not improve the benefit. An operation, per se, does not constitute a risk factor requiring chest radiographs.

Others have cited medicolegal reasons as a justification for including chest radiographs in the preoperative evaluation. However, data is available to mitigate this contention. Routine preoperative chest radiography is not supported in the medical literature and, therefore, cannot be considered the standard of care. Also, several authors have shown that many screening laboratory abnormalities should not be pursued. It can be argued that the risk of failure to follow-up an abnormal test presents a greater exposure to a lawsuit than not ordering a routine study.

Mendelson reviewed the records of 369 surgical patients and determined that in 9% of cases, the preoperative film was helpful for comparison in the management of postoperative chest radiographic findings. However, the actual effect of the baseline preoperative film on patient care could not be determined in his retrospective analysis. Thomsen et al studied 1,262 patients who had a preoperative chest radiograph. Sixteen percent went on to have postoperative films. Their conclusion was that the comparisons had no "therapeutic consequences in any case." In the paper by the Royal College of Radiologists, 70% of postoperative complications developed in patients without serious cardiopulmonary disease. On this basis, and assuming there is at least some value in having preoperative films for comparison, the authors argued that it would be necessary to radiograph up to 90% of all surgical patients to be reasonably sure of having a baseline available for all those in whom a postoperative pulmonary complication develops.

Several authors have argued that there are adverse effects that result from routine preoperative chest radiographs. First is the unnecessary radiation

exposure. Additional expense is another concern. Also, surgery may be delayed due to incidental findings or improper communication. As with routine nonsurgical chest radiographs, there is the additional cost and morbidity in the further evaluation of incidental findings such as solitary pulmonary nodules.

In 1984, the Royal College of Radiologists published a set of guidelines for the ordering of preoperative chest radiographs. Their parameters included scheduled cardiopulmonary surgery, age, suspected metastatic disease, acute respiratory symptoms and recent immigration from a country where tuberculosis is endemic. Since then, multiple authors have proposed their recommendations and guidelines for the use of preoperative chest radiographs. Other parameters presented include smoking, emergency cases, immunosuppressed patients, and American Society of Anesthesiologists (ASA) grades. Unfortunately, most of these publications base their conclusions upon statistical evaluation of the diagnostic yield of the chest radiograph interpretation. Some of the "positive" reports have included such findings as rib fractures, linear scarring, sub-segmental atelectasis, pleural scarring and mild increased cardiothoracic ratio which would likely have little to no effect on perioperative management. The real measure of the efficacy of routine chest radiographs in the preoperative setting is the impact on patient management and outcome analysis. It is in this context that a prospective study would greatly contribute to determining the appropriateness criteria to establish which patients would truly benefit from preoperative chest radiographs.

The review of the literature supports the summary of Munro et al, who carried out an exhaustive review of the literature for all types of preoperative testing including routine preoperative and admission chest radiographs.

1. No randomized controlled trials of the effectiveness of routine preadmission or preoperative chest radiographs have been published. All available evidence reports the results of case series.
2. Few studies allow the outcome of routine chest radiographs to be distinguished from those of indicated chest radiographs and fewer have gone beyond abnormalities to examine the impact on clinical management.
3. Findings from routine preoperative chest radiographs are reported as abnormal in 2.5%–37% of cases and lead to a change in clinical management in 0%–2.1% of cases. The effect on patient outcome is unknown.
4. Both abnormality yield and impact on patient management rise with age and poorer anesthesiology status.
5. Limited evidence on the value of chest radiography as a baseline measure suggests that it will be of value in less than 5% of patients.

The available evidence does not support a policy for performing routine admission or preoperative chest radiographs for all patients. Although there is no evidence available showing that such a policy would lead to worse outcomes for patients, the finding that only 2% of chest radiographs lead to a change in management of patients suggests a high level of cost and inconvenience with potentially limited benefits.

Because of the lack of adequate prospective studies, particularly studies that deal with the effect of admission and preoperative chest radiographs on patient outcome, a recommendation from the American College of Radiology that these studies not be obtained may be somewhat premature. However, given the current

evidence, routine preoperative and admission chest radiographs are not recommended except when the following conditions exist:

- Acute cardiopulmonary disease is suspected on the basis of history and physical examination.
- There is a history of stable chronic cardiopulmonary disease in an elderly (>65 years old) patient without a recent chest radiograph within the past six months.

Anticipated Exceptions

None

CLINICAL ALGORITHM(S)

None provided

EVIDENCE SUPPORTING THE RECOMMENDATIONS

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The recommendations are based on analysis of the current literature and expert panel consensus.

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

Appropriate use of preoperative and admission chest radiographs.

POTENTIAL HARMS

Several authors have argued that there are adverse effects that result from routine preoperative chest radiographs. First is the unnecessary radiation exposure. Additional expense is another concern. Also, surgery may be delayed due to incidental findings or improper communication. As with routine nonsurgical chest radiographs, there is the additional cost and morbidity in the further evaluation of incidental findings such as solitary pulmonary nodules.

QUALIFYING STATEMENTS

QUALIFYING STATEMENTS

An American College of Radiology (ACR) Task Force on Appropriateness Criteria and its expert panels have developed criteria for determining appropriate imaging examinations for diagnosis and treatment of specified medical condition(s). These criteria are intended to guide radiologists and referring physicians in making decisions regarding radiologic imaging and treatment. Generally, the complexity and severity of a patient's clinical condition should dictate the selection of

appropriate imaging procedures or treatments. Only those exams generally used for evaluation of the patient's condition are ranked. Other imaging studies necessary to evaluate other coexistent diseases or other medical consequences of this condition are not considered in this document. The availability of equipment or personnel may influence the selection of appropriate imaging procedures or treatments. Imaging techniques classified as investigational by the United States Food and Drug Administration (FDA) have not been considered in developing these criteria; however, study of new equipment and applications should be encouraged. The ultimate decision regarding the appropriateness of any specific radiologic examination or treatment must be made by the referring physician and radiologist in light of all the circumstances presented in an individual examination.

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

An implementation strategy was not provided.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Staying Healthy

IOM DOMAIN

Effectiveness

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

American College of Radiology (ACR), Expert Panel on Thoracic Imaging. Routine admission and preoperative chest radiography. Reston (VA): American College of Radiology (ACR); 2000. 5 p. (ACR appropriateness criteria). [36 references]

ADAPTATION

Not applicable: The guideline was not adapted from another source.

DATE RELEASED

2000

GUIDELINE DEVELOPER(S)

American College of Radiology - Medical Specialty Society

SOURCE(S) OF FUNDING

American College of Radiology

GUIDELINE COMMITTEE

Expert Panel on Thoracic Imaging

COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

Panel Members: Howard Fleishon, MD; Theresa C. McLoud, MD; Jack Westcott, MD; Sheila D. Davis, MD; Warren B. Gefter, MD; Claudia I. Henschke, MD, PhD; Robert D. Pugatch, MD; Henry Dirk Sostman, MD; Charles S. White, MD; David Yankelevitz, MD; Frederick R. Bode, MD

FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Not stated

GUIDELINE STATUS

This is the current release of the guideline.

All Appropriateness Criteria™ are reviewed annually and updated as appropriate.

GUIDELINE AVAILABILITY

Electronic copies: Available Portable Document Format (PDF) from the American College of Radiology (ACR) Web site.

Print copies: Available from the American College of Radiology, 1891 Preston White Drive, Reston, VA 20191. Telephone: (703) 648-8900.

AVAILABILITY OF COMPANION DOCUMENTS

None available

PATIENT RESOURCES

None available

NGC STATUS

This NGC summary was completed by ECRI on November 12, 2004. The information was verified by the guideline developer on December 21, 2004.

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Date Modified: 2/14/2005